Problem 1.

Obtain the Laplace transform of each of the following functions:

(a) $e^{-2t} \cos 3tu(t)$  
(b) $e^{-2t} \sin 4tu(t)$  
(c) $e^{-3t} \cosh 2tu(t)$  
(d) $e^{-4t} \sinh tu(t)$  
(e) $te^{-t} \sin 2tu(t)$

Problem 2.

Find the Laplace transform of each of the following functions:

(b) $3t^{4} e^{-2t} u(t)$  
(c) $2tu(t) - 4 \frac{d}{dt} \delta(t)$  
(d) $2e^{-(t-1)} u(t)$  
(e) $5u(t/2)$  
(f) $6e^{-t/3} u(t)$  
(g) $\frac{d^{n}}{dt^{n}} \delta t$

Problem 3.

Find the Laplace transform of the following signals:

(a) $f(t) = (2t + 4)u(t)$  
(b) $g(t) = (4 + 3e^{-2t})u(t)$  
(c) $h(t) = (6\sin(3t) + 8 \cos(3t))u(t)$  
(d) $x(t) = (e^{-2t} \cosh(4t))u(t)$

Problem 4.

Determine the Laplace transform of the function in the figure below. This is a periodic function with period $T=3$.

![Graph of a periodic function with a pulse height of 5 and period T=3]
Problem 5.

Determine the inverse Laplace transform of each of the following functions:

(a) \( F(s) = \frac{1}{s} + \frac{2}{s+1} \)

(b) \( G(s) = \frac{3s + 1}{s + 4} \)

(c) \( H(s) = \frac{4}{(s + 1)(s + 3)} \)

(d) \( J(s) = \frac{12}{(s + 2)^2(s + 4)} \)

Problem 6

Find \( f(t) \) for each \( F(s) \):

(a) \( \frac{10s}{(s + 1)(s + 2)(s + 3)} \)

(b) \( \frac{2s^2 + 4s + 1}{(s + 1)(s + 2)^3} \)

Problem 7.

Find the inverse Laplace transform of:

(a) \( H(s) = \frac{s + 4}{s(s + 2)} \)

(b) \( F(s) = \frac{e^{-4s}}{s + 2} \)